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ABSTRACT

To study the development of artistry across media, 45 kindergarten, first, and third grade children were given tasks in the media of drawing, clay, and storytelling. The tasks included spontaneous production, completion of a work, assembly of a work from numerous component parts, and copying a completed work. The spontaneous tasks were repeated for two more years with the same children. Products were rated on competence, flavorfulness, and uniqueness. Working styles were also analyzed using a variety of measures. Different developmental patterns were found in each medium. A large number of consistent trends in both product ratings and working style scores supported the notion of families of media: storytelling on one hand and drawing and clay on the other. (Author)

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HARVARD PROJECT ZERO

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Technical Report No. 8

ARTISTIC DEVELOPMENT IN THE EARLY SCHOOL YEARS:

A CROSS-MEDIA STUDY OF STORYTELLING, DRAWING, AND CLAY MODELLING

by

S. William Ives, Jenny Silverman,
Hope Kelly, and Howard Gardner

Issued: September 1979

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Artistic Development in the Early School Years:

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Introduction

By the time children begin formal schooling around age 6, they have acquired an impressive mastery of communicative language and have begun to use graphic media in a representational manner. A long apprenticeship during the preschool years preceded this mastery of symbolization, one of the principal developmental milestones in the ages from 2 to 5 (e.g., Gardner, in press b; Wolf and Gardner, in press). However, language development, for one, is far from complete at the onset of schooling (e.g., Chomsky, 1969; Horgan, 1977; Palermo and Molfese, 1972); similarly the aesthetic use of language in storytelling, poetry, humor, and figurative expressions continues to change (e.g., Gardner, in press a; Gardner and Gardner, 1971; Stein, 1977; Winner, Rosenstiel, and Gardner, 1976). By the same token, skills in drawing and the other visual media continue to evolve through a series of changes in both form (e.g., Carothers and Gardner, in press; Goodnow, 1977; Ives and Rovet, in press) and function (e.g., Gardner, in press c; Ives, in press a; Korzenik, 1977). In fact, one could argue that during the preschool years children acquire access to the basic symbol systems, while during the elementary school years they refine their use and understanding of these systems.

While it is generally agreed that the transition from early preschool symbol use to the approximation of adult mastery at adolescence is marked by a "literal" period where children concentrate on "technical" aspects of symbolization, there are multiple characterizations of this phenomenon. A Piagetian approach would view symbolic development as a uniform process dependent on, and simply reflecting, cognitive development (Piaget, 1962). Accordingly, the child's progress through concrete operational thinking should be equally reflected across all symbolic media. On the other hand, a number of other researchers have argued that development in symbolizing skills is not a unidimensional process; rather each symbolic medium places its own representational demands on the child and calls forth different cognitive skills (e.g., Gardner, in press a; Golomb, 1973; Goodnow, 1972; Ives, in press b; Olson, 1970).

These contrasting positions have important implications for understanding development in the arts and raise a number of questions about artistic progress through the elementary school years: Does the development of artistic competence proceed continuously upward with age across all media? Is there truth to the frequent claim that younger children's art is more "flavorful" and if so, does this phenomenon occur in all media? Does the

resulting profile of artistic development differ, depending on whether children are given a structured task or are allowed to express themselves spontaneously in each medium? Are there particular families of media which seem to be interrelated, requiring similar skills, and following the similar patterns of development? Finally, what is the relationship of school achievement to artistic development within each medium?

A proper examination of such questions calls for both longitudinal and cross-media investigations which sample a variety of tasks. To date few researchers have attempted to study children's performances across media: and such investigations as exist have generally focused on the preschool years (e.g., Golomb, 1973; Wolf, 1979) or on issues not directly related to the arts (e.g., Cellotta, 1973; Ives, in press b). To provide an initial account of development across media of elementary school children's participation in the arts the following study was devised.

Methods

Subjects

Fifteen students at each of three grade levels (kindergarten, first and third) participated in the study. The subjects, evenly divided between boys and girls, were randomly selected from a predominantly middle class suburban elementary school in the Boston area. Only children with known learning disabilities were excluded from the sample.

Procedures

Children's performances in two-dimensional depiction (drawing), three-dimensional depiction (clay), and language (storytelling) were elicited using tasks which entailed spontaneous production as well as those requiring completion, assembly, and copying.

Each child was seen individually by one experimenter in a small room. The sessions lasted from 20-40 minutes and the children were allowed to work at their own speed. Every child was seen three times, and in each session the four tasks from one medium were presented. The order of the tasks, as well as the order of the media, was counterbalanced.

Drawing. In the spontaneous drawing task children were presented with paper (8-1/2" by 11") and a set of colored markers and asked to make one drawing of anything they wished. In the completion task children were presented two incomplete drawings, one depicting a person (see Figure 1) and the other depicting a different object (see Figure 2 for one example). They were asked to complete the drawings using markers. In the assemble tasks children were given plastic shapes with adhesive backing and a blank board. They were asked to assemble a person and an object and then asked to repeat each assemblage in a different manner for a total of four assemble products. The copy task required the children to copy both the drawing of a person (see Figure 3) and an additional object (see Figure 4 for one example) using markers.

Clay. The spontaneous clay task consisted of requesting the children to use a large piece of playdough to model anything they wished. In the completion task children were asked to finish incomplete playdough figures presented to them by the experimenter. In the assemble task children were presented with a set of playdough shapes (spheres and cylinders) and asked to assemble both a person and an additional object. Then they were asked to repeat the assemblage of a person and an additional object in a different manner for a total of four assemble products. The copy task required the child to reproduce a playdough figure presented by the experimenter.

Storytelling. The spontaneous storytelling task consisted of asking the child to relate an original story. In the completion task the children were told the beginning of a story and asked to complete it. The children were offered a set of pictures in the story assemble task and asked to arrange them to create a story. Then they were asked to repeat the storytelling assemblage in a different manner. In the copy task children were read a story by the experimenter (see Figure 5 for the story) and simultaneously shown a picture illustrating the main characters (see Figure 6). Then they were asked to repeat the story.

The copy and spontaneous tasks in storytelling and drawing were repeated the following year with all children still attending the school. The spontaneous tasks in drawing, clay, and storytelling were again repeated a third year. All drawings were collected and saved. Photographs were made of clay products; stories were tape-recorded and later transcribed. Detailed notes were taken during all test sessions: these recorded all comments made by the children and noted the length of time spent on each task.

Scoring

Product Scores. After the first stage of testing had been completed, product scales were formulated and products rated on measures of competence, flavorfulness, and uniqueness. To explain the nature of these scales, a detailed list of the components of the storytelling scales are seen in Table 1. The drawing and clay competence scales are largely based on the McCarthy Scales of Children's Abilities and the flavor and uniqueness scales follow guidelines analogous to the language scales for those measures. All components of each scale were rated on a 0 - 2 basis and the total scores resulted from summing the component scores. All product scores were converted to percentages to facilitate comparisons. An example of one component of each of storytelling measures follows (see Table 1):

Language Competence: Clarity of Characters

0 = more than two confusions of who did the described actions
1 = one or two confusions of who did the described actions
2 = identity of characters is clear and no confusions

Language Flavor: Fantasy

0 = only elements which are indisputably part of child's experience
1 = real elements which are not likely part of the child's experience
2 = fantasy elements included

Language Uniqueness: Unusual Subject

0 = nothing unusual
1 = one event in story is unusual
2 = whole story is unusual

Product Scale Reliability. Each rating was made by two independent judges and reliability checks were made on all ratings. In cases of disagreement, a consensus score was reached. The level of agreement is reported in Table 2.

Working Style Scores. In addition, a set of scales was developed for rating each child's behavior during the testing session. These scales measured the children's social reactions to the task and the situation, their approach to the task, and their use of language during the testing sessions. Each measure was represented by a five-point scale, with 1 and 5 signifying two ends of a continuum (see Table 3 for a complete description of the measures). Ratings were made at the testing site immediately after each child's session. While one experimenter collected most of the data, reliability checks made on a small sample of the data by a second experimenter achieved an average reliability of 84%. Examples of the rating criteria for two of the rating scales follows:

Self-starter - Reluctant

5 = starts right away, no hesitation
4 = waits briefly and/or requires 1 prompt and/or says "I can't do it."
3 = waits more than 15 seconds and/or needs 2 prompts and/or 2 statements
2 = more than 2 prompts or 2 statements
1 = needs reorganization of task and/or physical and/or extra examples

Language related to task - Unrelated

5 = language refers only to task
4 = 75%/25% - few non-related statements
3 = 50/50
2 = 25/75
1 = language refers only to non-related events

Results

Cross-Sectional: Product Scores

Competence. An analysis of the tasks presenced during the first year reveals that while symbolic competence in the arts does increase with age, development does not proceed at the same pace or in the same manner across all media. A comparison of composite scores of each task in all three media shows that drawing competence improves dramatically in the one year between kindergarten and first grade, $t(28) = 6.56$, $p < .001$, but the difference is not significant between first and third grades (see Table 4). Similarly, competence in clay modelling increases significantly between kindergarten and first grade $t(28) = 4.37$, $p < .001$, but the difference is not significant between first and third grades. In contrast, storytelling competence increases more steadily, with marked improvement occurring at each grade level: kindergarten versus first grade, $t(27) = 3.75$, $p < .003$; first grade versus third grade, $t(28) = 3.95$, $p < .002$ (see Table 4).

Flavor and Uniqueness. An analysis of the composite scores across tasks within each medium reveals that the degree of flavorfulness in drawings increases between kindergarten and first grade, $t(28) = 4.42$, $p < .001$, and actually declines, though non-significantly, between first and third grade (see Table 4). Flavorfulness in clay shows a non-significant increase between kindergarten and first grade and then by third grade declines to the kindergarten level. In contrast, flavorfulness in stories continues to increase gradually between kindergarten and third grade, $t(27) = 4.66$, $p < .001$.

The uniqueness scores in all three media follow a pattern similar to the flavorfulness scores: uniqueness in drawing and clay reaches a peak at first grade and then declines by third grade, while uniqueness in storytelling continues to increase. However, because of the low level of uniqueness throughout, none of the grade level differences approach significance.

Structured versus Spontaneous Tasks. In the second year of testing both copy and spontaneous tasks were assigned to the children: thus, by combining first and second year scores one obtains data over a five year span (see Figure 7). A comparison between competence in spontaneous and copy tasks in both drawing and storytelling reveals few differences between tasks; development in each medium follows the distinct trends outlined above, with the products on copy tasks receiving a slightly higher competence rating than the spontaneous tasks. In addition, children's drawing competence scores are more consistent from year to year on copy tasks than on spontaneous tasks, whereas storytelling competence scores prove quite consistent on all tasks from year to year (see Table 5).

On measures of flavorfulness and uniqueness there are distinct developmental differences between spontaneous and copy tasks. In both

storytelling and drawing, a greater increase occurs in flavor and uniqueness for spontaneous tasks between kindergarten and first grade than occurs for copy tasks. However, between first and third grade flavor and uniqueness in spontaneous tasks begin to decline, while in storytelling they continue to increase.

A correlation matrix of first year scores on all four types of tasks (spontaneous, complete, assemble, and copy) in each of the three media is presented in Table 6. In drawing, competence and flavor scores generally achieve significant correlations between tasks, the sole exception being the assemble condition. Three-dimensional tasks also tend to show stronger correlations between the non-assemble tasks. Performance on storytelling tasks achieve the highest inter-consistency of all three media, with significant correlations on all task comparisons within the medium on both competence and flavor scores. Again, drawing scores are more similar to clay scores with the storytelling scores displaying a somewhat different pattern

Cross-Media Correlations. A comparison of correlations between composite scores of all tasks for each medium within each grade level is found in Table 7. Six of the possible 27 correlations between drawing and clay achieve a significant correlation over .500 whereas only one of the possible 54 correlations between either drawing or clay and storytelling is significant. Again, empirical support is found for linking drawing and clay while storytelling development appears to exhibit separate trends.

A comparison of the correlations between different dependent measures within each medium reveals a greater within- than between-media consistency. Storytelling tasks result in the highest within-medium correlations, followed by clay and then drawing. While storytelling scores are consistently correlated across all types of comparisons, clay flavor and uniqueness are more frequently correlated with each other than competence; in drawing, competence and flavor are more frequently correlated with each other than with uniqueness. In general, significant correlations across media tend to be found on measures of flavor and uniqueness, while positive correlations also exist within each medium between measures of competence and flavor or uniqueness; this result implies that abilities to generate flavorful and unique performances are more likely than competence to carry across media. Thus, while children appear to exhibit different levels of competence in each media, they may possess a general underlying sense of expressiveness which results in more uniform scores in flavor and uniqueness across media.

Comparison with School Achievement Tests. Only scores on storytelling competence correlate significantly with the Stanford Achievement Test scores (reading scores, $r = .403$, $p < .05$; math scores, $r = .433$, $p < .05$; auditory scores, $r = .546$, $p < .01$); all correlations between test scores and measures in the other media as well as those with storytelling flavor and uniqueness are non-significant. This lack of correlation suggests that skills in drawing and clay are not tapped by standard scholastic achievement tests.

Cross-Sectional: Working Styles

Working style ratings provide additional evidence for developmental differences in children's approach to linguistic and non-linguistic media (see Table 3 for a complete listing of the ratings). Careful quantitative methods were followed for scoring working styles (see scoring section); but we will only offer a narrative overview of the results here, along with some examples of quantitative comparisons (see Figure 8 and Table 8).

Affective Style. While children display a moderate level of enthusiasm and a high degree of comfort in all tasks, certain media differences are evident. In non-linguistic tasks enthusiasm and comfort remain constant between kindergarten and third grade whereas in linguistic tasks they rise from kindergarten to third grade. Cross-media comparisons indicate that third graders display more enthusiasm on the storytelling tasks than on non-linguistic tasks, but kindergartners and first graders seem unaffected by the medium within which they work. Third graders seem equally comfortable in all task situations, whereas the younger children are less comfortable on storytelling tasks.

The self-confidence expressed also shows divergence between non-linguistic and linguistic media (see Figure 3). Most children express few self-deprecating remarks and seem rather sure of themselves. On non-linguistic tasks, the degree of confidence rises between kindergarten and first grade, but then drops at third grade to below the first grade level. Third graders are most likely to make such remarks as "I stink at drawing." On storytelling tasks the degree of confidence rises steadily from kindergarten to third grade. The relationship between confidence ratings in clay and drawing decline with age but continue to be positive through third grade whereas there is a highly significant negative correlation between confidence in drawing and storytelling in first grade (see Table 8).

The degree of playfulness decreases from kindergarten to third grade on all media except storytelling (see Figure 8). Kindergartners are moderately playful on drawing and clay tasks, while older children are more serious about their work. On drawing tasks, first and third graders display the same degree of playfulness; on storytelling tasks kindergartners and first graders display the same behavior, while third graders become somewhat more playful. First graders are more consistent in their degree of playfulness with significant rank-order correlations resulting from comparisons of drawing scores with both clay and storytelling (see Table 8).

Task Involvement. Children in all ages show little hesitation to begin tasks in the non-linguistic media (see Figure 8). In storytelling, however, kindergartners, and to a lesser degree, first graders show more hesitation to begin than do older children. The relationship between self-starting ratings in drawing and clay declines with age whereas there is an increasing consistency with age between self-starting in storytelling and drawing (see Table 8).

The "degree of prompting" ratings follow a trend similar to the self-starting ratings: in drawing and clay little prompting is needed by any age group--only kindergartners require the experimenter's help whereas in storytelling both kindergartners and first graders require prompts to continue.

Children of all ages accept the drawing tasks as given, whereas with clay, kindergarteners are less likely to accept the task. On storytelling tasks, both kindergartners and first graders offer some resistance to the given task and often change it (for example, telling a familiar tale rather than creating their own story).

The degree to which children are task- or experimenter-oriented follows separate trends for each medium. In drawing, kindergartners are more focused on the experimenter, first graders focus on the task, and third graders are equally divided between the task and the experimenter. In storytelling tasks, children become progressively less experimenter focused from kindergarten to third grade, perhaps reflecting their increasing ease with storytelling. In clay tasks, little variation is found between grade levels, with most children equally balanced between experimenter and task.

Planning and Evaluative Skills. No evidence of critical abilities and very little evidence of forethought is manifest by an age group on the storytelling tasks. In drawing and clay, it is only third graders who exhibit critical comments, and most of these are general statements such as "It is no good." Some evidence of forethought is displayed on these tasks by all age groups. Usually, their remarks are also quite simple, consisting of statements about what the child is going to make.

On all tasks, children become more logical and orderly with each successive age level (see Figure 8). This progression is quite linear in the linguistic tasks. However, improvement in the non-linguistic tasks is seen only between kindergarten and first grade and not between first and third grade. The relationship between the use of a logical procedure in drawing and clay increases with age, with significant rank-order correlations in first and third grade. The use of a logical procedure in drawing and storytelling sharply changes with age, from a significant positive correlation in kindergarten to a highly significant negative one in third grade (see Table 9).

Language Use. Several measures recorded the use of language during the testing sessions involving non-linguistic media (see Table 1). At all grade levels there is a low to moderate level of talking on these tasks, with greater differences occurring between individual children than across grade levels.

The ratio of language to action is fairly consistent at all age levels, with children more involved with action than talking. On drawing tasks, kindergartners are likely to talk both while they are drawing and at pauses, while the older children usually talk only during pauses. These findings

are consistent with general developmental trends in the use of self-directed speech in actions (e.g., Rubin and Dyck, 1979; Vygotsky, 1962). However, no such differences are found in the clay tasks with children of all ages talking both during and between the action. In drawing tasks, the language spoken is likely to be directly related to the task and more so for third graders than for younger children. On clay tasks, third graders make many more non-task related comments than do the younger children, for example, asking personal questions of the experimenter or demonstrating knowledge in unrelated areas.

Longitudinal Results

The longitudinal study of spontaneous art products corroborates the above findings. Drawing competence tends to increase from kindergarten to second grade with little improvement after that time. In fact, competence actually decreases from third to fourth grade. Storytelling competence on the other hand, increases steadily between kindergarten and fourth grade, dropping slightly at the fifth grade level. Figure 9 presents the combined scores for all grade levels across all three years of testing, thereby providing data for six grade levels. The separate results for each grade level within each of the three years of testing is presented in Table 9 with significance levels obtained from T-test comparisons.

Drawing flavor rises dramatically between kindergarten and first grade, and then level off, dropping at third grade before beginning to rise again at the fifth grade level. Storytelling flavor conforms to the pattern of storytelling competence, rising steadily from kindergarten to fourth grade, and then tapering off.

It is clear from the data that distinct patterns of development characterize the various symbolic media. To summarize, the largest gains in drawing competence occur between kindergarten and second grade; thereafter, the level of competence remains fairly stable, while flavor and uniqueness scores actually decrease. Clay performances are generally consistent with drawing performances on flavor and uniqueness measures. However, in clay competence measures a significant increase was found in the third year of testing between second and fifth grade children's scores $t(18) = 3.21$, $p < .02$. No such increase is evident in children's scores on the drawing task (see Table 9). Storytelling competence, on the other hand, shows continual improvement from kindergarten through fourth grade. Flavor and uniqueness scores seem to be tied to this development, dropping off when a stable level of competence occurs. The summary data for spontaneous tasks for all three years is found in Table 9.

Conclusion

The results provide some initial answers to the questions raised in the introduction. For example, artistic competence does not proceed

upward across all media. More flavorfulness is found in the drawings and clay works of young children than in the drawings and clay works of older children; however, this trend is not found in their storytelling. Differences occur between structured and unstructured tasks, with increased competence in the former and increased flavor and uniqueness in the latter.

The most significant grouping of results are found in the large number of consistent trends in both production and process scores which support the notion of particular families of media: storytelling on one hand, drawing and clay on the other. Children show a steady pattern of increasing scores in storytelling tasks on measures of the competence, flavor, and uniqueness of their products (see Tables 4 and 9, Figures 7 and 9), as well as on most of the working style measures (see Figure 8). This pattern holds for both structured and unstructured storytelling tasks (see Figure 7). In contrast, the patterns of development for the same measures of children's drawing and clay both show a more uneven movement, with dramatic increases from kindergarten to first grade and a subsequent decline or leveling off over the next few years. In addition, within-media correlations reveal that children are more consistent on storytelling tasks than on either drawing or clay tasks 1) from year to year on spontaneous and copy tasks (see Table 5), 2) across the four levels of structure within tasks (see Table 6), and 3) between each of the product measures (see Table 7). Moreover, cross-media correlations reveal a closer connection between drawing and clay scores than between either of these two media and storytelling on both product scores (see Table 7) and working style scores (see Table 8).

While these results weaken arguments for a unified semiotic function (cf. Piaget, 1962), they also indicate that developmental patterns between particular media are not necessarily unrelated. Using the framework suggested by Nelson Goodman (1968), the results from the three symbolic media can be grouped by the degree of notionality within the symbol system operating through each medium. A symbol system is said to be notational when it has separate, discrete characters like letters in an alphabet: in this case certain aspects of the symbol differentiate it from other symbols and thus convey meaning. For example, the use of curved or straight lines can differentiate a "u" from a "v" but the thickness of these lines conveys no referential meaning. A symbolic medium can itself be used either notationally or non-notationally. In a non—notational symbol system all aspects of the symbol convey meaning. For example, in a picture, every detail of a line may contribute to the work's significance. Children gradually and steadily increase in their ability to use the more notational symbol system of language, whereas the non-notational use of drawing and clay follows a more uneven development.

The continued increase in storytelling development may reflect, in part, elementary school children's general reliance on language for communication; it can convey most of their needs more effectively and efficiently while drawing and clay are less robust vehicles of communication. In addition, the elementary school certainly cultivates linguistic skills to a greater extent than it cultivates skills in the plastic media.

Indeed, only competence in storytelling correlates significantly with school achievement scores. Children's self-consciousness about drawing and clay may also be greater than their self-consciousness about language use, in which, after all, they participate all the time. Moreover, drawing and clay production leaves a visual record which can be analyzed by the child and others, perhaps prompting more self-critical behavior.

The study spawns certain educational implications. In addition to outlining the normative trends across media which are important for devising educational strategies, specific suggestions for strategies can be found in the results. The declining trends in drawing and clay suggest that these media need to be kept open for children as vehicles for communication of both referential and expressive meaning. In that way, children will not be so self-critical and self-conscious as they come to realize that there are certain messages, themes, emotions, and referents for which the plastic media are especially well suited. They have probably concluded, erroneously, that everything worth communicating can be said in verbal statements or told in stories. It is important to communicate the many potentials for expression in the non-notational use of the plastic media.

In summary, development in drawing and clay reaches a peak around first grade and then begins a decline as children proceed through elementary school and acquire concrete operational thinking. Development in storytelling continues to increase during the early elementary school period but shows some initial signs of decline in fifth grade, the last year of our testing. This trend is consistent with previous findings which indicate a peak in storytelling around age 12 as children begin to enter the stage of formal operational thinking (Gardner and Gardner, 1971). Certainly as children enter adolescence, some new dimensions of their activities with various media may come into play and further study is in order to map these trends.

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Table 1

Product Rating Scales for Language Tasks (Storytelling)

Competence	Flavor	Uniqueness
Plot drama	Fantasy elements included	Unusual subject
Clarity of characters	Elaboration of setting	Unusual form
Clarity of events	Time reference	Unusual figures of speech
Connectedness	Type of character	Unusual words
Number of episodes	Characters named	Unusual characters/setting
Number of quotes	Figurative language	Unusual imagery
Inner complexity of characters: presence of emotional attributes	Use of descriptive phrases	
	Expression in voice	
	Expression of feelings	

Table 2

Product Scale Reliability Coefficients

Medium	Competence Scores	Flavor Scores	Uniqueness Scores
Drawing	.89	.93	.84
Clay	.87	.92	.87
Language	.80	.90	.90

Table 3

Working Style Measures (Five Point Continuum)

Affective Style	Task Involvement	Planning & Evaluative Skills	Language Use
Enthusiasm	Self-Starting	Critical Ability	Amount of Talking
Comfort	Need for Prompting	Evidence of Forethought	Ratio of Language/Action
Confidence	Acceptance or Revision of Task	Logical, Orderly Procedure	Talk and Action: Together/Separate
Playfulness	Task Centered/Experimenter Centered		Language in Tasks: Related/Unrelated
	Self Identification with Product		

Table 4

First Year Product Scores Across Tasks

Grade	Drawing			Clay			Language		
	Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores
K	.426	.111	.104	.392	.041	.039	.310	.273	.085
1	.621	.288	.123	.514	.081	.059	.484	.429	.133
3	.676	.249	.077	.545	.048	.038	.623	.497	.153

* $p < .01$

** $p < .001$

Table 5

Correlations Between Competence Scores in Different Testing Years

Years Correlated	Drawing		Language	
	Copy Tasks	Spontaneous Tasks	Copy Tasks	Spontaneous Tasks
First and Second	.750*	-.117	.761*	.764*
Second and Third	--	.221	--	.631*

* $p < .001$

Table 6

Correlations of Tasks within Medium for First Year Scores Across Grade Level

Tasks Correlated	Drawing			Clay			Language		
	Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores
Spontaneous & Assemble	.231	.326*	.245	.305	.398*	-.065	.684***	.367	-.082
Spontaneous & Complete	.459**	.455***	.140	.601***	-.079	.054	.659***	.592***	.530***
Spontaneous & Copy	.562***	.257	.016	.503**	.259	.198	.697***	.528**	.071
Assemble & Complete	.072	.295*	.324*	.318*	.108	-.075	.490***	.491***	.196
Assemble & Copy	.121	.539***	.185	.629***	.375*	-.183	.658***	.483**	.217
Complete & Copy	.510***	.526***	.221	.569***	-.092	.005	.493**	.599***	.362*

* $p < .05$

** $p < .01$

*** $p < .001$

Table 7

Correlation Matrix for First Year Product Scores within Grade Levels by Media and Response Measure

Grade Level	Media	Response Measure	Drawing: Competence Scores	Drawing: Flavor Scores	Drawing: Uniqueness Scores	Clay: Competence Scores	Clay: Flavor Scores	Clay: Uniqueness Scores	Language: Competence Scores	Language: Flavor Scores
K	Drawing	Flavor	.827***	--						
		Uniqueness	.251	.371	--					
	Clay	Competence	.434	.346	-.017	--				
		Flavor	.465	.536*	.194	.330	--			
		Uniqueness	-.050	-.118	-.112	-.048	.561*	--		
	Language	Competence	.252	.130	.046	.231	.171	.193		
		Flavor	-.048	.018	-.118	.336	-.301	-.363	.471	--
		Uniqueness	-.102	-.046	-.291	.360	-.200	.009	.069	.667**
1	Drawing	Flavor	.744**	--						
		Uniqueness	-.024	.229	--					
	Clay	Competence	.369	.364	.315	--				
		Flavor	.619*	.434	.208	.482	--			
		Uniqueness	.523*	.595	.364	.443	.785***	--		
	Language	Competence	.210	.303	-.256	-.116	-.294	-.007	--	
		Flavor	.208	.230	.102	-.405	-.327	-.010	.521*	--
		Uniqueness	.040	.040	.389	-.326	-.114	-.098	.280	.782***
3	Drawing	Flavor	.217	--						
		Uniqueness	.084	.456	--					
	Clay	Competence	.543*	.414	.106	--				
		Flavor	.346	.622*	.325	.583*	--			
		Uniqueness	.463	.389	.076	.664**	.736**	--		
	Language	Competence	.048	.281	.159	-.002	.174	-.106	--	
		Flavor	-.099	.350	.470	.103	.087	.103	.640*	--
		Uniqueness	.007	.496	.715**	.212	.209	.102	.568*	.883***

* $p < .05$

** $p < .01$

*** $p < .001$

Table 8

Cross-Media Spearman Rank-Order Correlations for First Year Working Style Scores for Each Grade Level

Media	Grade	Self-Starting	Confidence	Playfulness	Logical, Orderly Procedure
Drawing & Clay	K	.46*	.59*	.46*	.43
	1	.39	.22	.66*	.55*
	3	.29	.20	.21	.62*
Drawing & Language	K	-.13	.41	.10	.80**
	1	.53*	-.80**	.67**	.31
	3	.63*	.39	.43	-.72**

* $p < .05$

** $p < .01$

Table 9

Product Scores on Spontaneous Tasks Over Three Years of Testing

Testing Year	Grade Level	Drawing			Clay			Language		
		Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores	Competence Scores	Flavor Scores	Uniqueness Scores
1	K	.439	.230 *	.167	.519 *	.077	.027 *	.340 *	.321	.067 **
	1	.642 ***	.647	.340	.764 *	.246	.153	.526 ***	.550 ***	.189 **
	3	.785	.486	.193	.851	.100	.060	.693	.675	.307
2	1	.602	.500	.289				.326 **	.331	.067
	2	.761	.557	.286				.559 ***	.575 *	.158 *
	4	.703	.483	.231				.721	.696	.246
3	2	.701	.478	.267	.472 *	.189	.083	.448	.406	.033 *
	3	.741	.569	.302	.783 **	.126	.057	.566	.542	.215 **
	5	.701	.660	.240	.933	.145	.064	.643	.591	.273

* $p < .05$ (difference between grade levels)
** $p < .01$
*** $p < .001$

Figure 1. Stimulus for Drawing Completion Task (Person)

Figure 2. One Stimulus for Drawing Completion Task (Other Object)

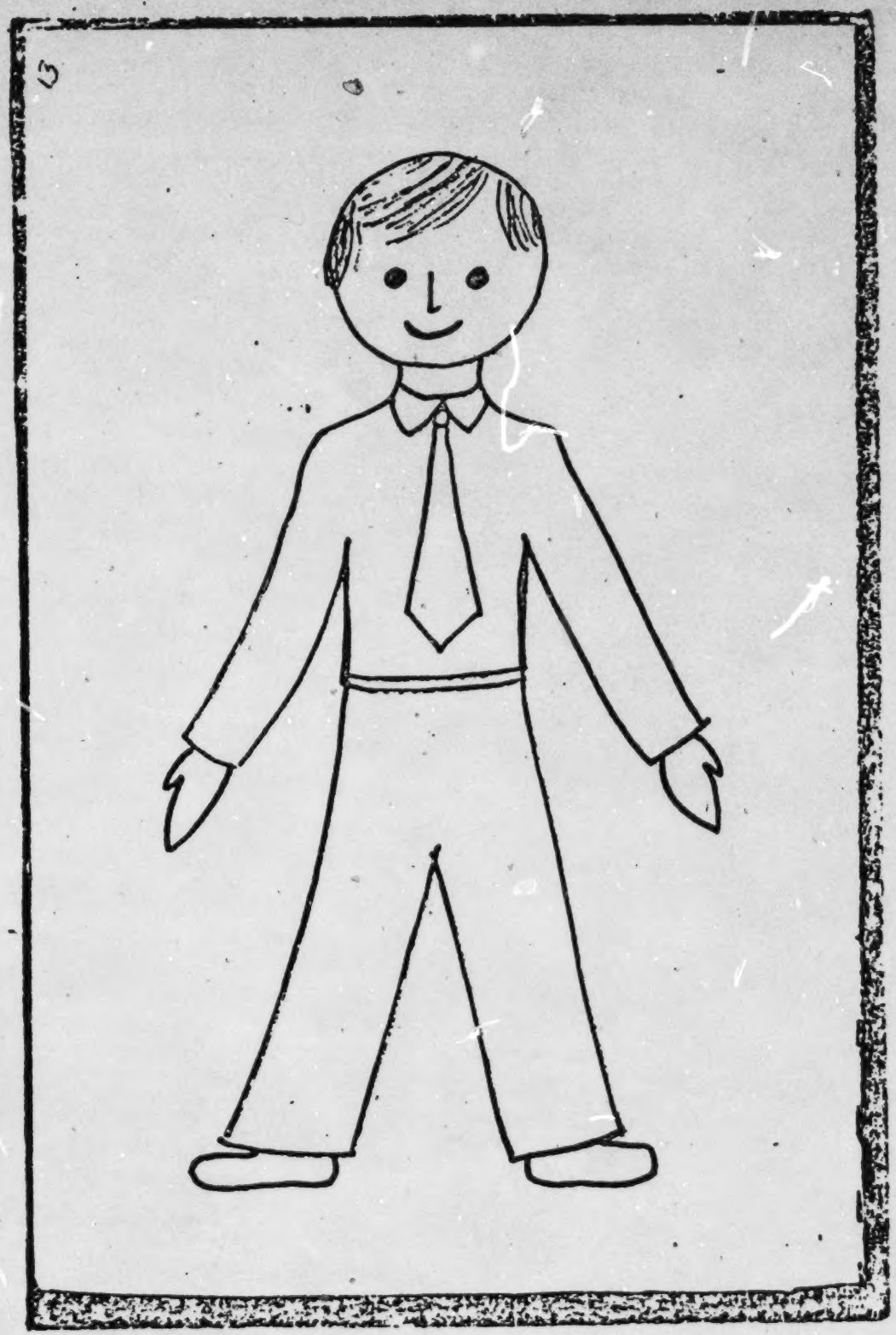

Figure 3. Stimulus for Drawing Copy Task (Person)

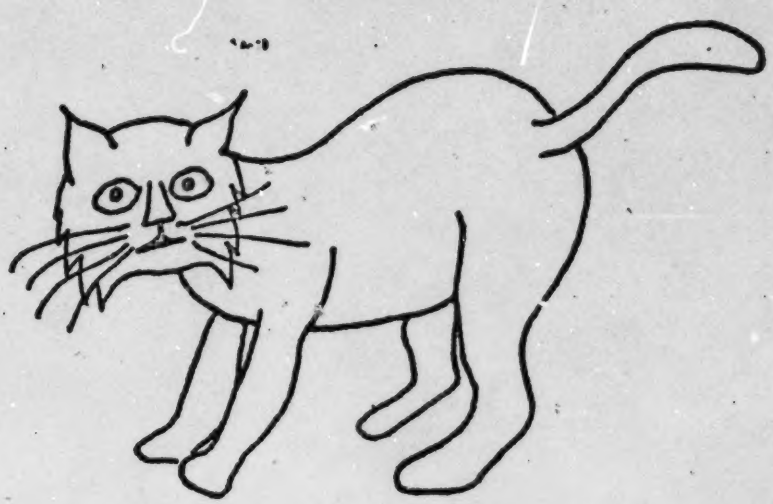

Figure 4. One Stimulus for Drawing Copy Task (Other Object)

THE THREE GOATS

There was once a Boy who had three goats. All day they leaped and pranced and skipped and climbed up on the rocky hill, but at night the Boy drove them home. One night, when he went to meet them, the frisky goats leaped into a turnip field and he could not get them out. Then the Boy sat down and cried.

As he sat there a Rabbit came along. "Why do you cry?" asked the Rabbit.

"I cry because I can't get the goats out of the field," answered the Boy.

"I'll do it," said the Rabbit. So he tried but the goats would not come. Then the Rabbit, too, sat down and cried.

Along came 2 Foxes.

"Why do you cry?" asked the 2 Foxes.

"I am crying because the Boy cries," said the Rabbit; "and the Boy is crying because he cannot get the goats out of the turnip field."

"We'll do it," said the Foxes.

So the Foxes tried, but the Goats would not come. Then the Foxes also sat down and cried.

A little after, a Bee flew over the hill and saw them all sitting there crying. "Why do you cry?" said the Bee to the Foxes.

"We are crying because the Rabbit cries and the Rabbit cries because the Boy cries and the Boy cries because he cannot get the Goats out of the turnip field."

"I'll do it!" said the Bee.

Then all the big Animals and the Boy all stopped crying for a moment to laugh at the tiny Bee. He do it, indeed, when they could not! But the tiny Bee flew away into the turnip field and lit upon one of the Goats and said,"

"Buzz-z-z-z-z-z-z!"

And out ran the Goats, every one!

Figure 5. Stimulus for Storytelling Copy Task

Figure 6. Illustration for Storytelling Copy Task

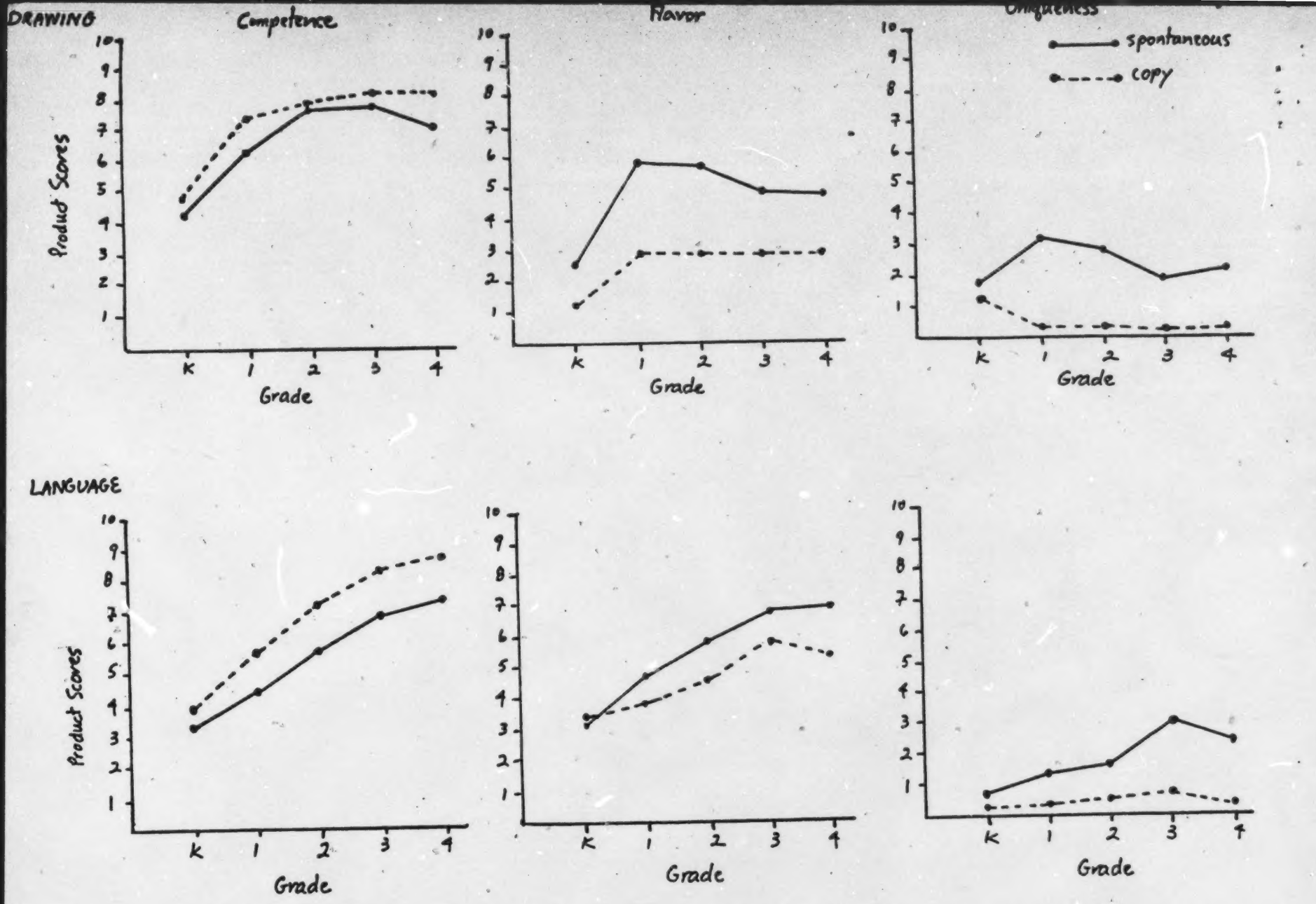

Figure 7. Spontaneous and Copy Scores for Drawing and Language Across the First Two Years of Testing

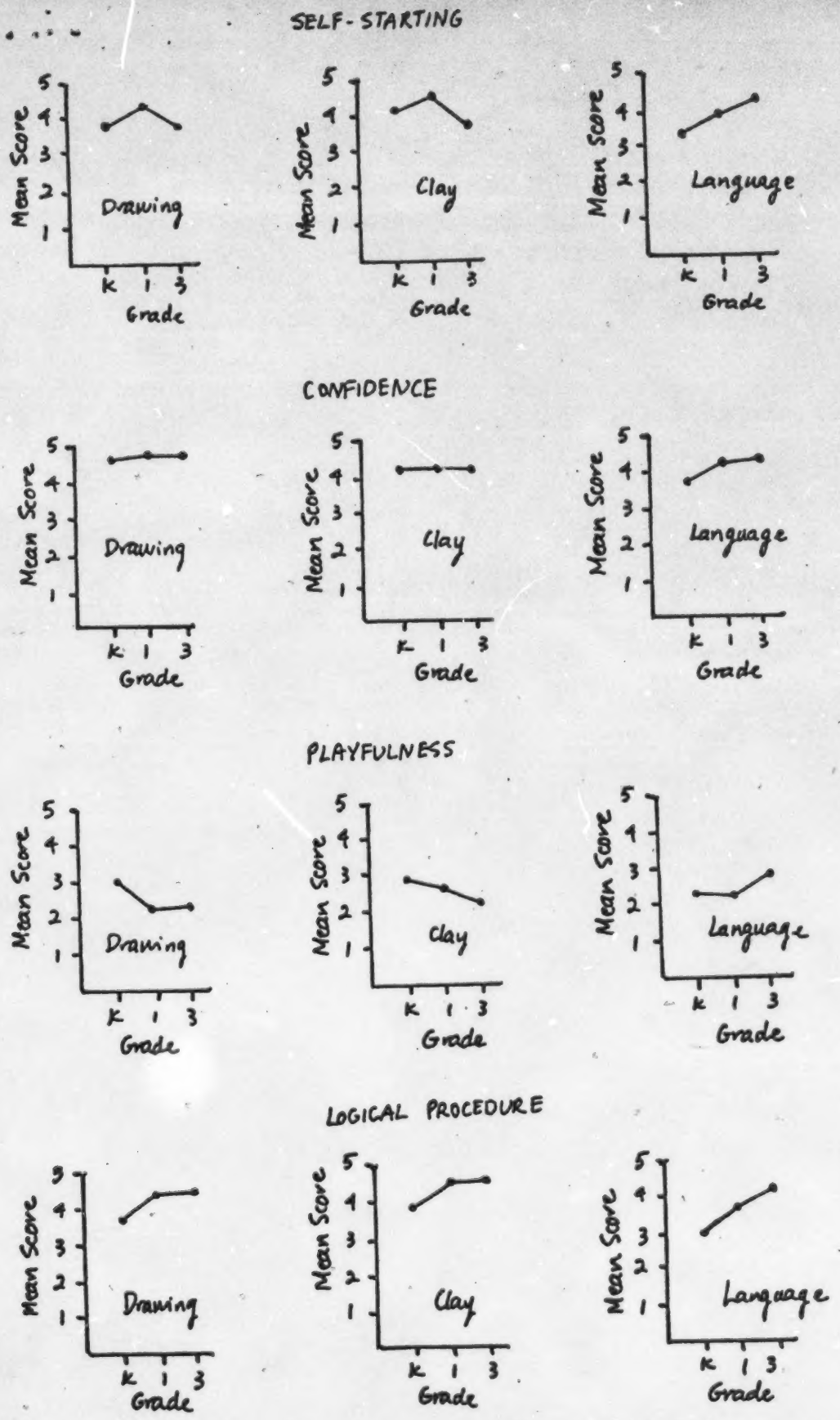

Figure 8. First Year Working Style Ratings by Grade and Medium

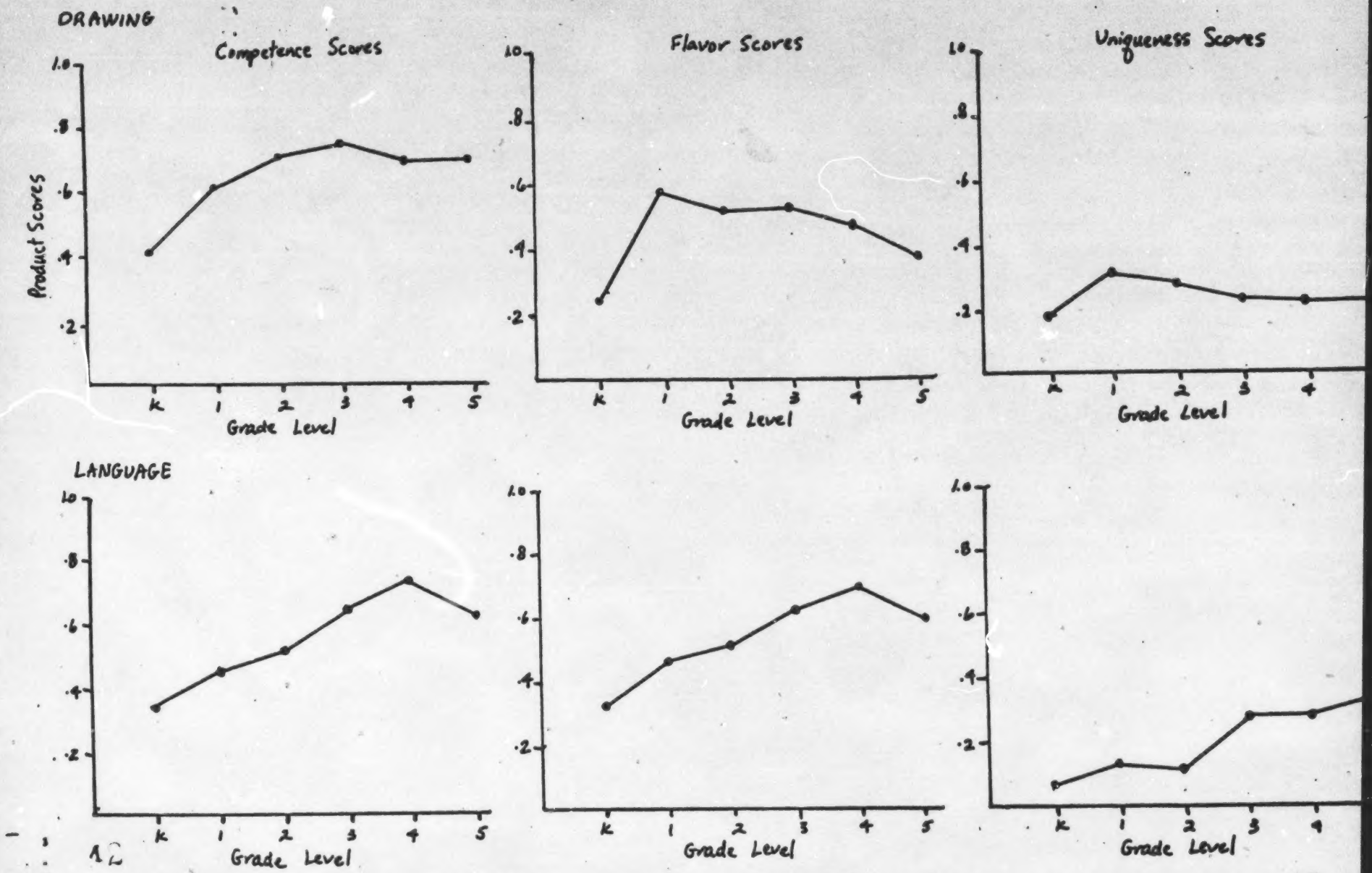

Figure 9. Spontaneous Task Scores for Drawing and Language Across all Three Years of Testing

Harvard Project Zero is a basic research program at the Harvard Graduate School of Education. Its original charge was to study creation and comprehension in the arts and means toward better art education. A prime objective throughout the Project's history has been to provide a sound theoretical and experimental base for effective education of artists and audiences. The Project began in the fall of 1967 in response to the frank admission that, however much is known about how to educate in science and how to evaluate scientific work, practically nothing is known about the underlying principles of how to teach and evaluate in art. From that challenging "zero" the Project took its name and tasks. Our research methods include rigorous conceptual analysis, investigation of relevant literature, design and execution of key experiments in psychology and other fields, visits to arts education institutions, and application of results to proposing and assessing programs in art education.

Project founder and former director Nelson Goodman's book Languages of Art (Bobbs-Merrill, 1968) has provided important direction in our effort to isolate and investigate basic skills. This work sets forth a "theory of symbols," a broad treatment of elements of communication, embracing words, gestures, diagrams, paintings, poems, musical scores, and so on. Almost all the psychological processes under consideration in our studies of the arts involve extensive operation with and upon symbols of various kinds. These symbols are not merely instruments of communication, but also instruments of cognition, tools in terms of which the mind deals with the perceptual world.

Some of our research has examined the psychological implications of the theoretical models of symbol systems introduced in Languages of Art. For instance, one question is whether different information processing skills are necessary to produce effective art within linguistic, versus nonlinguistic, symbol systems. Another, complementary approach emphasizes problem solving and search strategies in the moment-to-moment perception and production of a work of art. How do subjects search for rhyme words in poetry or explore alternative placements of pieces in collage? A favorite means of developing and testing new models is through the study of errors. By using impoverished or ambiguous stimuli, assigning tasks somewhat too difficult for a subject, or working with brain-damaged subjects, one can elicit patterns of error-making which suggest hypotheses and select between alternative models of a process. These approaches characterize many of the Project's investigations mentioned below in a list of Project members and their particular interests.

Though the development of actual curricula in arts education is not a primary concern, the Project does contribute to the field of practical education. Project members have responded to inquiries and requests to comment on curricula from teachers in the field. Establishment of Harvard Summer School's Institute in Arts Administration resulted from the Project's reply to an inquiry from the director of the Harvard Summer School, and members of the Project staff cooperated in planning the Institute, in preparing material, and in the actual teaching. Consideration consultation has been provided to schools, museums, television, and a variety of arts institutions by members of the Project.

The Project has also sponsored a series of lecture-performances in various media, designed to give the general public and prospective public school teachers and administrators better insight into and attitudes towards artists and the arts. As the series title "Art in the Making" suggests, the purpose of the lecture-demonstrations was to reveal something of the artist's way of working, rather than to display his products. In the presence of an audience free to ask questions, each artist explored alternatives, exposed some constraints of his medium, compared his various efforts, and searched for the right effect, choice by choice.

While maintaining a major concern with the arts and art education, the Project, under its current co-directors, has considerably broadened its field of inquiry and now investigates a whole range of topics in the area of cognitive psychology. One part of the Project has focussed particularly on developmental studies. Among the topics currently being investigated are the emergence of symbolic capacities during the first years of life; the development of literary abilities, specifically the capacity to produce and appreciate metaphors and stories; children's understandings of the various worlds presented on television; the emergence of drawing skills; and the breakdown of various symbol using capacities under various forms of brain damage. The other part of the Project has concentrated on studies in the areas of cognitive and perceptual psychology, ones which utilize both normal adult subjects and gifted artists. Among the topics investigated recently have been critical judgment and the sources of critical disagreement in adults; the thought processes of professional and amateur poets and painters in developing works; the role of geometric principles in visual perception and picture perception particularly; reasoning about everyday matters and the logical difficulties people encounter.

A list of recent papers which can be purchased from the Project is available upon request.